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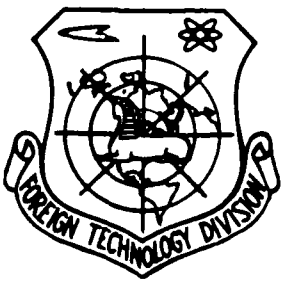
FOREIGN TECHNOLOGY DIVISION

NEWS AND TRENDS

by

Gu Shijie



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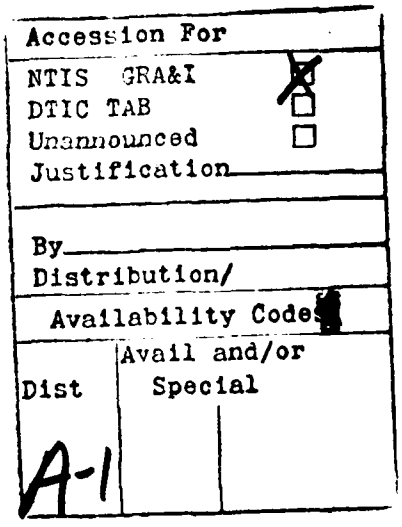


Successful Test Production of Transverse and Longitudinal Automatic Feed System in Burnt Corrosion Test

Electric arc heater burn corrosion testing is the principal means for ground simulation tests in research on the heat shield layers of reentry vehicles. In order to better simulate flight conditions, people have consistently put effort into improving the capabilities of electric arc heaters. In line with this improving of the operating technology of electric arc heaters, use was made of various types of water cooled sensor electrodes, which are easily destroyed by burning. Because of this, instantaneous state enthalpy or heat content probes, zero point heat measuring devices, and other similar rapid scan type probes should be operated in order to survive. Moreover, the latter require a set of adjustable velocity high speed horizontal movement structures. Only then is operation possible. Increases in the amount of burn corrosion make it easy for models to get out of areas of equal pressure. It is necessary to automatically compensate for the amount of burn corrosion retreat. In addition to this, the flurry of activity during testing missions and increased requirements for replicable conditions cause operations carried out with methods in which only one model is burned one time to be totally incapable of meeting the requirements of the testing task. Because of this, a type of automatic feed or advance system which is capable of handling high speed scanning probes, automatically compensating for the amount of burn corrosion, and, in one operation, testing multiple models and probes has long been what test workers have been moving toward.

In Institute No.5 of the Aerodynamics Center, on the basis of the operations, it was necessary to set up a combined project team for the test production of an automatic feed system. Test production was begun in 1976. It achieved success at the end of 1980. Morecver, it was formally introduced into heater measurement tests. The method of feed and the structural form of this system have some differences from the automatic feed systems in the related units in the U.S. However, their functions are the same. The automatic feed system makes use of a longitudinal automatic feed controled by a laser position determined high speed electromagnetic clutch which can precisely compensate for the amount of the retreat or withdrawal at the time of burn corrosion on a model. Moreover, it makes use of a digital display of position movement. Each time there is operation, it is possible to include five models or probes in the tests. When a model is burned, it is possible to use methods which fix time or fix the amount of burning as additional controls. After going through more than two years of on site adjustments and tests, we have eliminated electromagnetic interference, and, at the present time, it is possible to operate in an electric arc heater arc chamber at a pressure of 30 atmospheres. Various types of high speed probes are used in this system to measure the pressure cross section of the heater jet, the heat flow cross section and the gas flow heat content or enthalpy, burn corrosion test quantities and efficiencies, and they all showed very large increases.

(unclear) Shijie

The First Dual-Pulse Laser Holographic Camera in China

The dual-pulse laser holographic camera is a type of equipment for advanced testing and analysis in dynamics and mechanical engineering which has developed rapidly since the last part of the 1970s. The JQS-1 model dual-pulse laser holographic camera which was successfully test produced at the Beijing Photoelectric Technology Research Institute is a type of dynamic holographic recording device.

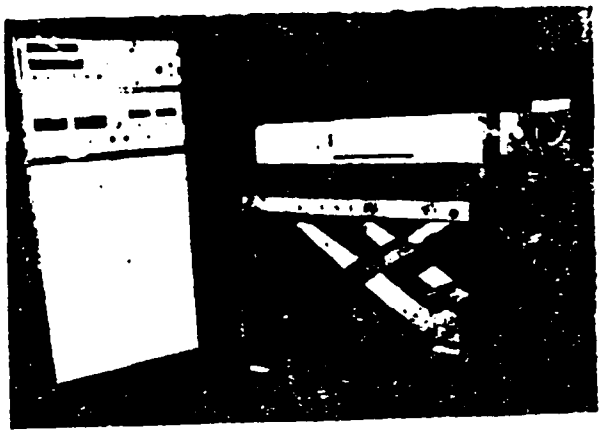
It uses the two light pulses emitted sequentially by a dual-pulse ruby laser exciter in a fixed time interval as the light source (the pulse width was 50 nanoseconds). The two states during the object surface change process were recorded on the same holographic plate by the holographic recording system. After exposure and fixation, the holographic plate was illuminated with the helium-neon laser. The redeveloped interference patterns showed the change in apparent positions of the object. Going through this device, one rapidly records various types of transitional forms (such as vibration, deformation, stress propogation, flow fields, and similar items) in order to obtain mechanics parameters under conditions of dynamic analysis, to arrive at improved structural designs, and raise the level of prod . This system was mainly used in testing and analysis in fields such as mechanics, space flight, and precision mechanical engineering. In a relative comparison with the general run of static holograph equipment, which uses continuous laser devices as light sources, it not longer requires a firmly fixed and clumsy high precision anti-vibration platform. Due to the fact that it is possible to directly use it with test objects or samples under operating conditions, it follows that it expands the range of applications of holographic measurement technology into mechanics and mechanical engineering.

JQS-1 model dual-pulse laser holographic cameras use a composite structure. The assembled device is composed of seven components: the main body box of the camera (including the ruby laser device, the light path, and other similar components), the moveable raising and lowering frame, the temperature stabilization water box or radiator, the electrical control box, the power source box, the oscillation stage energy storage capacitor box, and the amplifier stage energy storage capacitor box. The structure of this instrument has the special characteristics below. It has a common light path regulation structure. The range of camera elevation and depression is 700-1300 mm. Reference light and object light can be rotated 360 degrees. The overall device is a composite or assembled structure. It is easy to move to the site of operations. Its principal technical function

indicators are: dual-pulse laser energy greater than 2x100 millijoules; coherence length, 1 meter; pulse width, 20-70 nanoseconds; pulse interval within 100-1000 microseconds, all with dual-pulse output (dual-pulse interval measurement error within 1 microsecond); synchronous precision smaller than $\pm$2 microseconds.

This device was already evaluated during the last ten days of February, 1981. It went through tests and checks all over China. The evaluation committee acknowledged that our country's first JQS-1 model dual-pulse laser holographic camera, which was successfully test produced by the Beijing Photoelectric Technology Research Institute, fills the void in our country for dual-pulse laser holographic camera equipment. The various technical indicators on the sample machine reached design requirements. In a situation in which domestically produced components were selected throughout, a certain number of principal indicators approached the advanced levels of foreign products of the same type and period. The structural design of the sample machine was reasonable. Operation was simple and easy. It was realtively well-suited to its use.

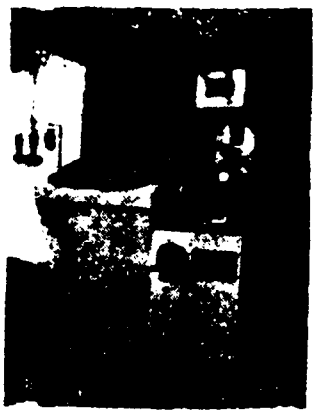
Wang Ying



Dual-Pulse Laser Holographic Camera

The WZT-600 Projecting Photoelastic Instrument

In the photoelastic experiments, the stripes or striations were closely spaced in areas of concentrated stress. Observation and measurements were difficult. In order to resolve this problem, the Beijing Scientific Instrument Plant produced the WZT-600 projecting 79 photoelastic instrument. It is an instrument capable of taking test stock stress diagrams and precisely enlarging them. Moreover, it is capable of precisely measuring stress striations. In observations and measurements of locations in which stress striations are concentrated, for evaluation of the strength factor K_1 in fracture mechanics, analysis of the Moire pattern, measurement of the external geometries of the test stock, and for the measurment of longitudinal and transverse coordinates, as well as other similar aspects, its use is relatively convenient in all cases.



The object support surface of the operating platform on the WZT-600 projecting photoelastic instrucment is a level one. The placement of test objects or stock is relatively convenient. The projection screen level is slanted forward, making it easier for the operator to observe the measurements and diagrams. The polarization

fields of polarization systems can be rotated synchronously by the use of a handle. With the operation of a handle, it is possible to realize the transformation of a circular polarization field and a linear polarization field. The area of the projection screen is large. The design of optical systems and the manufacturing is precise. This guarantees that, on the whole projection screen, it is possible everywhere to obtain accurate and clear imagery. The objective is long and is able to measure relatively large dimension test pieces or stock. It is also advantageous for the placement of auxilliary items. Quartz compensators and polarization segments connect. It is possible, in situations involving the transformations of circular and linear polarization fields, not to choose lower compensators, and do continuous point to point measurements of isocline line and arithmetic mean striation values. As far as the instrument's being fitted with black colored hanging curtain light cut-offs is concerned, it is possible to carry out measurement operations inside other than dark rooms.

The basic characteristics of the instrument are as follows. The projection screen diameter is ϕ 600mm. The diameter of the object placement viewing field is $\geq$ 60mm. The objective enlargement power is 10x. The operation platform measurement range in the longitudinal direction is 50mm. In the transverse direction, it is 25mm. The range of polarization field rotation is $\pm 90^{\circ}$. The segment plate gradation value is 1°. The operation platform display value precision is to less than 0.01mm.

For display of the results of measurements of the stresses in the same test item, this instrument and a similar type of imported instrument have the same sort of overall measurement precision.

Cai Zuji

Small Model Diffusion Type Photoelastic Instrument

In the teaching and study of optical elastic mechanics, students doing tests with their own hands is the key link between teachers and students. The Beijing scientific instrument plant designed and produced the WZH-100 diffusion or scattering type photoelastic device, which has definite precision, multiple functions, small viewing field, and low price.

The polarized light field diameter of this instrument is ϕ100mm. The polarized light field can synchronously rotate $\pm 90^{\circ}$. Two one-quarter wave segments mutually form a 45° position. It is possible to obtain circular polarized light fields and linear polarized light fields. The light source is a white colored diffused or scattered light illumination. With the addition of filter color segments to observations, it is possible to obtain single color stress striation charts. The polarization and dispersion segments are all able to rotate independently. Moreover, they have a calibration index angle of rotation, and it is able to make Tardy compensation method measurements of fractional series striation values.

WZH-100 diffusion type photoelastic instruments are capable of being combined with transmission type photoelastic instruments in order to make tests. It is also possible to take dispersion segments and fix them on the box cover of the instrument forming a reflection type photoelastic instrument to make tests. The instrument can also be put into a 55x17x15cm box. Storage and portability are both very convenient.

Cui Zuji

WZT Teaching Projection Photoelastic Instrument

The WZT teaching projection photoelastic instrument is a teaching instrument which was test manufactured and produced by the Beijing scientific instrument plant to the requirements of teaching and is suited to the Physics and Engineering Science School of the Dalian Technical Institute. It is able to have a relatively large projection image. Moreover, from the middle of it, one clearly sees the striation imagery for the stresses in the test items, causing the photoelastic theory of auditorium lectures to be turned into a graphic form.

On this instrument, it is possible to carry out photoelastic tests of segments with flat surface models receiving forces and uni-directional congealed models. Under illumination from polarized light on flat surfaces or circular polarized light, it is possible to see a stress distribution diagram for transparent plastic models put in a stressed condition. From this diagram, it is possible to [illegible] and direction of forces. Moreover, going through transparent calibration discs, it is possible to carry out quantitative measurements and tests. Due to the fact that the WZT teaching projection photoelastic instrument also has other accessories that go with it, it is possible, as a result, to make tests of tensile, bending or shear, pure bending, compression, and other similar aspects.

The WZ160 teaching projection photoelastic instrument has been through evaluation and test use by the relevent departments and the Dalian Techical Institute, and they recognize that this instrument's capabilities are stable and reliable, that the structure is novel, that it is light and convenient, and that its operation and portability are convenient.

Liu Guifang

Small Model Wind Powered Electric Generators

In line with the daily improvement of the life of the masses of the people, the requirements of farmers and herdsmen for televisions, blowers, desk fans, tape recorders, record players, and lanaing lights, grow daily more urgent. Due to the fact that farming and herding areas are far from the electrical grids, the test manufacture and production of small models of wind powered electrical generators to supply as power sources to farmers and herdsmen has special significance.

The one (one character unclear, probably kilowatt) and under small models of wind powered electric generators produced by the herding machines plant of Shangdu Prefecture in Inner Mongolia go through the process of wind-wind turbine-electric generator-alternating current flow-commutation-direct current flow-battery-user in order to generate electricity. In order to make the electricity put out from this type of small model of wind powered electric generator suit the requirements of batteries as well as limiting the speed of rotation of the wind turbine or wheel to within a certain specified value, in terms of the generator, the wind turbine, the speed limiting mechanism, the direction adjustment system, the frame and other similar aspects, all have fixed technical requirements. Electrical generators should select for use low speed large diameter permanent magnet type alternating current generators with good starting characteristics. The wind turbine or wheel should then be designed to make it possess good aerodynamic efficiency and relatively high rotation speed (one can select this by empirical methods). Generally, it does not exceed 300 revolutions/minute. The speed adjustment method is one involving wind pressure. The direction adjustment system is then a relatively simple fin or tail plane direction adjustment. The frame is then selected as a simple and economical tubular frame.

One kilowatt small models of wind powered electrical generators, in areas where the wind power resources are relatively adequate, have a simple structure, few technical difficulties, are easy to manufacture, are low cost, and have the special feature of having energy storage problems which are easy to resolve. They will get a welcome from the broad masses of farmers and herdsmen.

Liu Chongdong

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